Ch. 5 Review **NAME:** Key

1) List the 4 conditions for something to be considered a binomial setting:

   1. set # of obs.
   2. 2 outcomes: success/failure
   3. prob. stays same
   4. each trial indep.

2) In order to use the normal approximation to the binomial, what check must be passed?

   np, $n(1-p) \geq 10$

3) Assuming a binomial situation applies, what are…

   a. μ_X and σ_X?

   $\mu_X = n \cdot p \qquad \sigma_X = \sqrt{n \cdot p(1-p)}$

   b. $\mu_{\hat{p}}$ and $\sigma_{\hat{p}}$?

   $\mu_{\hat{p}} = p \qquad \sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$

4) Determine whether each binomial distribution with given *n* and *p* can be approximated with the normal.

   a. $n = 40,\ p = .4$ yes

   b. $n = 50,\ p = .2$ yes

   c. $n = 30,\ p = .8$ no

5) For each of the following values of *p*, determine the minimum sample size need to use the normal approximation.

   a. $p = .25$

   $n \cdot p = 10$

   $n = 40$

   b. $p = .38$

   $n \cdot p = 10$

   $n = 27$

   c. $p = .76$ $1-p = 0.24$

   ~~$n \cdot p$~~

   $n(1-p) = 10$

   $n = 42$

For the following questions, USE YOUR FLOWCHART! And don't forget your checks on ALL problems!!

6) 23% percent of cars do not pass their Motor Vehicle inspections the first time. What is the probability that out of the 570 cars that usually come through a specific inspection station, less than 125 will fail inspection?

$P(x<125) = \text{normcdf}(-E99, 125, 131.1, 10.$

$570(.23) \geq 10$
$570(.77)$ ✓

$= 0.2719$

7) A burglar alarm system has 6 fail-safe components that act independently. The probability of each failing is .05. Find the following probabilities.

$\cancel{6(0.05) \geq 10}$
$\cancel{6(0.95)}$

a. Exactly 3 will fail.

$P(x=3) = 0.002143$

b. Fewer than 2 will fail.

$P(x<2) = P(x\leq 1) = 0.96723$

c. None will fail.

$P(x=0) = 0.7351$

8) Suppose that 70% of all dialysis patients will survive for at least 5 years. If 100 new dialysis patients are selected at random, what is the probability that the proportion surviving for at least 5 years will exceed 80% ?

$P(\hat{p} > 0.80) = \text{normcdf}($

$100(0.70) \geq 10$
$100(0.30)$ ✓

$= 0.0145$

9) Of all 18-year-old children, 70% are enrolled in a college or trade school. If a sample of 1200 such children is randomly selected, find the probability that at least 1000 will be enrolled in a college or trade school.

$P(x>1000) = \text{normcdf}($

$1200(0.70) \geq 10$
$1200(0.30)$ ✓

$= 3.488 \times 10^{-24}$

10) A surgical procedure is successful 80% of the time. In a random sample of 200 patients, find the probability that the sample proportion is within .02 of the mean.

$P(0.78 \leq \hat{p} \leq 0.82) = \text{normcdf}$

$200(0.80) \geq 10$
$200(0.20)$ ✓

$= 0.521$

11) Consider an experiment that calls for drawing five cards, one at a time with replacement, from a shuffled deck. The drawn card is identified as a spade or not a spade, returned to the deck, the deck is reshuffled, and so on. Let X be the number of spades observed in 5 drawings.

A. Verify that this is a binomial experiment. What is the value of p?

$p = \frac{1}{4} = 0.25 \quad n = 5$

B. Determine the probability distribution (find $P(X=1)$, $P(X=2)$, etc.).

$\cancel{5(0.25)}$ $\cancel{5(0.75)}$

X	0	1	2	3	4	5
P(X)	0.2373	0.3955	0.2637	0.0879	0.0146	0.000977

C. Find $P(X \leq 3)$ and the probability that at least one card is a spade.

0.9844

$P(X \geq 1) = 1 - P(X=0) = 0.7627$

D. Find μ and σ for the problem.

$\mu_X = 1.25 \quad \sigma_X = 0.9682$

12) Ninety percent of the trees planted by a landscaping firm survive. What is the probability that eight out of ten will survive? That at least eight will survive?

$\cancel{(0.9)(10)}$ $\cancel{(0.1)(10)} \geq 10$

$P(X=8) = 0.1937$

$P(X \geq 8) = 1 - P(X \leq 7) = 0.9298$

This problem is different from the rest…take note of WHAT the problem gives you

13) The average life for a Duracel AAA battery is claimed to be 980 hours. A skeptical researcher does not believe this. Duracel claims that the standard deviation of the batteries is 15.8 hours.

$\mu = 980$
$\sigma = 15.8$

a. What is the probability that if the researcher picks one battery to examine, it will last more than 1000 hours?

$P(X > 1000) = \text{normcdf}(1000, E99, 980, 15.8) = 0.1028$

b. The researcher decides to take a better sample. She selects a package of 36 batteries and examines them. What is the probability that the average length that these 36 batteries last is more than 1000 hours?

$n = 36 \geq 30$

$P(\bar{x} > 1000) = \text{normcdf}(1000, E99, 980, \frac{15.8}{\sqrt{36}})$
$= 1.553 \times 10^{-14}$